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| 10/708,883 | 03/30/2004 | Timothy J. Dalton | FIS920030331US1 | 2882 |

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| EXAMINER |
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VO, HAI

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| ART UNIT | PAPER NUMBER |
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1771

DATE MAILED: 06/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/708,883

Applicant(s)

DALTON ET AL.

Examiner

Hai Vo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 9-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 0330.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Election/Restrictions

1. The examiner respectfully wishes to point out that Group III, claims 1-9 set forth in the Restriction made on 03/20/2006 was in error. It should be correctly listed as Group III, claims 1-8. Applicant's election with traverse of Group III, claims 1-8 in the reply filed on 04/04/2006 is acknowledged. The traversal is on the ground(s) that a search for the subject matter of Group I would encompass a search for the subject matter of Group II and Group III. This is not found persuasive because the search of Group I does not require a search in the same areas as a search for Groups II and III. The inventions of Groups I-III have been classified into three different classes, namely 257, 313 and 428.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3, 5 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Fukuda et al (US 5,165,991). Fukuda teaches a dielectric material comprising a porous aluminum oxide film having a plurality of pores dispersed throughout the film (column 2, lines 30-37 and figure 1). The pores have an average pore size of 15 to 20 nm (column 3, lines 8-10). The porous aluminum oxide film has a porosity of 20

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to 80% (column 4, lines 25-27). The pores are filled with nitrogen gas, silane gas (column 5, lines 60-62). Accordingly, Fukuda anticipates the claimed subject matter.

4. Claims 1, 3, 4, 7 and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawamura (US 6,528,108). Kawamura teaches a dielectric material comprising a porous silicon oxide film having a plurality of pores dispersed throughout the film (column 4, lines 19-21 and figures 5-7). The pores have an average pore size of 1 to 50 nm (column 4, lines 19-21). The pores are filled with silane gas and SiF₆ gas (column 5, lines 10-12). Accordingly, Kawamura anticipates the claimed subject matter.
5. Claims 1, 2 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Engel et al (US 6,472,740). Engel teaches a dielectric material comprising a porous silicon dioxide film having a plurality of pores dispersed throughout the film (column 2, lines 30-31). The pores are filled with N₂ or SF₆ gas (column 3, lines 54-55). Accordingly, Engel anticipates the claimed subject matter.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda et al (US 5,165,991) as applied to claim 1 above, Engel et al (US 6,472,740). Fukuda

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does not specifically disclose the pores having been filled with SF₆ gas. Engel, however, teaches the voids of the dielectric material having been filled a N₂ or SF₆ gas (column 3, lines 54-55). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to fill the voids of the dielectric material with nitrogen gas or SF₆ gas because nitrogen gas or SF₆ gas have been shown in the art to be recognized equivalent gases being filled into the voids of the dielectric material for reducing an average dielectric constant of the dielectric material.

8. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura (US 6,528,108) as applied to claim 1 above, and further in view of the admitted prior art as set forth in the paragraph 10 and 11 of the present specification. Kawamura does not specifically disclose the void content of the dielectric material. The admitted prior art, however, discloses a porous dielectric material typically having a pore with pore size from 0.1 to 10 nm and a void content from 20% to 75%. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the dielectric material having a void content as described in the admitted prior art because such is a typical porosity of the dielectric material for use in semiconductor devices.
9. Claims 2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura (US 6,528,108) as applied to claim 1 above, and further in view of Engel et al (US 6,472,740). Kawamura does not specifically disclose the pores having been filled with inert gas or SF₆ gas. Engel, however, teaches the voids of the

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dielectric material having been filled a N₂ or SF₆ gas (column 3, lines 54-55).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to fill the voids of the dielectric material with nitrogen gas or SF₆ gas because nitrogen gas, silane gas or SF₆ gas have been shown in the art to be recognized equivalent gases being filled into the voids of the dielectric material for reducing an average dielectric constant of the dielectric material.

10. Claims 1, 2 and 4-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Neill et al (US 6,187,248) in view of Engel et al (US 6,472,740). O'Neill teaches a dielectric material comprising a porous polyimide film having a plurality of pores dispersed throughout the film. The pores have an average pore size of less than 30 nm (column 3, lines 43-45). The porous insulating film has a porosity of 10 to 60% (column 4, lines 53-55). O'Neill does not specifically disclose that the pores are filled with nitrogen gas, SF₆ gas. Engel, however, teaches the voids of the dielectric material having been filled a N₂ or SF₆ gas (column 3, lines 54-55). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to fill the voids of the dielectric material with nitrogen gas or SF₆ gas because filling these gases into the voids of the dielectric material has been shown in the art for reducing an average dielectric constant of the dielectric material.
11. Claims 1-3, and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Neill et al (US 6,187,248) in view of Fukuda et al (US 5,165,991). O'Neill teaches a dielectric material comprising a porous polyimide film having a plurality of pores dispersed throughout the film. The pores have an average pore size of less than 30

nm (column 3, lines 43-45). The porous insulating film has a porosity of 10 to 60% (column 4, lines 53-55). O'Neill does not specifically disclose that the pores are filled with nitrogen gas, silane gas. Fukuda teaches a dielectric material comprising a porous polyimide film having a plurality of pores dispersed throughout the film (column 2, lines 30-37 and figure 1). The pores are filled with nitrogen gas, silane gas (column 5, lines 60-62). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to fill the voids of the dielectric material with nitrogen gas or silane gas because filling these gases into the voids of the dielectric material has been shown in the art for reducing an average dielectric constant of the dielectric material.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai Vo whose telephone number is (571) 272-1485. The examiner can normally be reached on Monday through Thursday, from 9:00 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris can be reached on (571) 272-1478. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HV

Hai Vo

**HA VO
PRIMARY EXAMINER**